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Photography in the Transit of Venus. By W. de W. Abney, R.E.

I venture to offer a few remarks on a subject which has lately seemed to occupy the minds of a limited portion of the press correspondents who write on astronomical subjects, I mean on the supposed inferiority of the English method of solar photography in comparison with the American during the late Transit of *Venus*. Much stress has been laid on the fact that you can measure the focus of a 40-foot telescope and calculate the diameter of the Sun as it should appear on the plate. It seems to me that there is no more difficulty in calculating the diameter with the English photoheliograph than with this. At all events, it is not an impossibility. This difficulty being placed on one side, there seems to me to be very little superiority left for the American system, and, further, there are drawbacks to it which cannot be glossed over. Supposing that the images be distorted in both systems, in the English system that distortion can only arise from causes in the telescope itself, and can be corrected by photographing a scale, in different relative positions to the object-glass. This is what is being done at Greenwich now. Distortion in the American system can also arise from the heliostat; and I think that the difficulty of estimating the amount due to the telescope itself, as well as to the heliostat, will be a matter for the gravest consideration. We are also told that irradiation is a great drawback to our system. I think the effect of irradiation has been vastly overrated. The indistinctness which often accompanies the Sun's limb is very little due to it in my opinion. It is principally caused by the heating of the atmosphere between ourselves and the Sun, and the consequent disturbance apparent only round its edge. The irradiation in the plates we used is reduced to a minimum, as the albuminate of silver which fastens the minute particles of iodide and bromide of silver together is nearly of the same specific gravity as that of the two latter. Experiment after experiment has shown to me that irradiation proper is really due to a reflexion from these minute particles, and if we connect them, forming nearly a continuous mass of the same specific gravity, it must be materially reduced, and perhaps eliminated. The irradiation due to reflexion from the back of the plate can be totally avoided; and I have found no difference in using glass as a vehicle in which to carry the collodion, or a substance totally opaque, when the plates were prepared as we used them.

Daguerreotype plates are not free from irradiation, as is claimed for them, as can be proved by experiment; and in my humble judgment it was most judicious of the Astronomer Royal not to have insisted on their employment, as they are subject to much greater fluctuations of expansion than are glass negatives. They are much less sensitive, and it would have been almost impossible to have produced a 4-inch picture of the Sun with a moderate

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1875MNRAS..35..310G

exposure. Indistinctness of the Sun's limb is more apparent with wet plates than with dry, for a reason I should like to state. In dry plates the principal development is carried out by the alkaline method, which only utilizes the bromide in the plate, whilst with wet plates the iodide *and* bromide are both utilized. The sensitiveness of iodide to weak radiations is much greater than of bromide, hence the atmospheric disturbance round the Sun's limb is developed to a less distance with the former than with the latter, there being a rapid diminution in the intensity of the light, as the distance from the limb is increased. On but few days is the atmosphere undisturbed; when it is, the limb will be nearly as sharp by one method as by the other, though the dry plate will still have an advantage due to the lessened irradiation. One great disadvantage in the American system is this, that there is a body of air heated between the heliostat and the object-glass. This must cause an unequal seething round the Sun's limb, and an error in measurements might occur from this alone.

It may be of interest to some to learn this fact, viz., that at Rodriguez 9 Janssen plates were exposed, and not 9 images on one Janssen plate. In a letter in one daily paper I read that as each Janssen plate was to contain 60 pictures, 51 failed, as there were only 9 exposed. The writer fell into an error here, mistaking the word "plate" for something else. These accidental slips often prove most injurious, and should be corrected. I have therefore taken this opportunity of saying that at Rodriguez the Janssen plates were quite successful, and that the proper number of pictures were obtained in each of the 9, making a total of 441.

Note on the Transit of Venus. By J. E. Gore, Esq.

(*Communicated by Mr. Browning.*)

I saw the transit of *Venus* with the telescope you sent me (a 3-in. achromatic). I could see no black-drop at ingress, but at egress, using a reduced aperture of 1½ in., a very small ligament was visible. At ingress with the full aperture, I distinctly saw the disk of *Venus* outside the Sun's limb sometime before internal (external?) contact.

Umballa, India,
1875, *January* 25.

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